

**REMARKS**

This response is being filed after the shortened statutory period for filing a response to the outstanding Office Action. Therefore, a petition and a fee for an extension are enclosed herewith.

Hereinafter, the claims that are pending prior to the entry of the amendments in this Amendment are called "currently pending claims." This Amendment amends currently pending Claims 1-7, 10, 12, 14, 17, 21, and 23. Upon amendment, the above-identified U.S. patent application will have two independent claims (currently amended Claims 1 and 21) and 35 total claims (currently amended Claims 1-7, withdrawn Claim 8, currently amended Claim 10, previously presented Claim 11, currently amended Claim 12, previously presented Claim 13, currently amended Claim 14, previously presented Claims 15 and 16, currently amended Claim 17, previously presented Claim 18, withdrawn Claim 20, currently amended Claims 21 and 23, previously presented Claims 24, 25, 27-37, and withdrawn Claims 38 and 39). The Applicants previously paid for up to three independent claims and 35 total claims. Therefore, no fee is due for excess claims.

Support for all of the claim amendments can be found in the originally filed application. For example, support for amending currently pending Claim 1 can be found in, inter alia, Examples 8 and 11-16 on pages 50-53 of the specification of the above-identified U.S. application because in these Examples the inorganic support (silica) is not functionalized before it is reacted with an alumoxane (MAO). Support for amending currently pending Claim 6 can be found in, inter alia, originally filed Claim 6 (as renumbered after filing). Support for amending currently pending Claim 21 can be found in, inter alia, originally

filed Claim 5 (as renumbered after filing).

Currently amended Claims 1-7, currently amended Claim 10, previously presented Claim 11, currently amended Claim 12, previously presented Claim 13, currently amended Claim 14, previously presented Claims 15 and 16, currently amended Claim 17, previously presented Claim 18, currently amended Claims 21 and 23, and previously presented Claims 24, 25, and 27-37 are readable upon the elected invention. If elected currently amended Claims 1 and 21 are allowable, then the Examiner should consider nonelected withdrawn Subclaims 8, 20, 38, and 39 on the merits because these subclaims are each dependent on an elected allowable base claim (currently amended Claim 1 or 21).

Any provisional obviousness-type double-patenting rejections in the outstanding Office Action are respectfully traversed; and the Applicants will decide at a future time whether or not to file terminal disclaimers to overcome these rejections.

Any rejections under 35 U.S.C. § 112, second paragraph, in the outstanding Office Action are respectfully traversed.

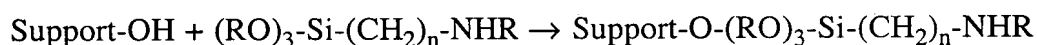
Furthermore, these rejections are now moot and should be withdrawn because currently amended Claims 1-7, withdrawn Claim 8, currently amended Claim 10, previously presented Claim 11, currently amended Claim 12, previously presented Claim 13, currently amended Claim 14, previously presented Claims 15 and 16, currently amended Claim 17, previously presented Claim 18, withdrawn Claim 20, currently amended Claims 21 and 23, previously presented Claims 24, 25, 27-37, and withdrawn Claims 38 and 39 are clear and definite under 35 U.S.C. § 112, second paragraph.

In the outstanding Office Action, the Examiner rejects currently pending Claims 1-7, 10-18, 21, 23-25, and 27-37 for allegedly being anticipated by or obvious over European Patent Document No.

0 802 203 (hereinafter referred to as the "Hidalgo-Llinas document"). The Applicants respectfully traverse this rejection for the reasons that are set forth below; and, consequently, this rejection should be withdrawn.

The Hidalgo-Llinas document discloses a process for preparing a catalytic system comprising the following three consecutive steps, which are described below:

Step 1: Functionalizing an inorganic support containing surface hydroxy groups by reaction with a bifunctional compound of Formula I (see lines 22-23 on page 8 of the Hidalgo-Llinas document). Formula I (see lines 1-10 on page 4 of the Hidalgo-Llinas document) contains two types of reactive groups: (1) Si-(OR) groups, which react with the hydroxy groups on the surface of the inorganic support; and (2) an additional heteroatom-containing functional group (e.g., an optionally substituted amine group or a thiol group). The chemistry involved in Step 1 may be summarized as follows:



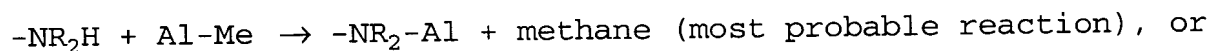
As indicated in the preceding reaction scheme, hydroxy groups on the support surface react with the organic reagent and a siloxy ether linkage is formed. The resulting treated support containing an organic molecule attached through a siloxiether bond is known as a "functionalized support," which is represented by Formula II (see lines 27-43 on page 8 of the Hidalgo-Llinas document).

Step 2: Reacting an organoaluminum compound (e.g., methylaluminoxane (MAO)) with the functionalized support from Step 1 (see lines 47-48 on page 8 of the Hidalgo-Llinas document) to yield an organoaluminum-treated functionalized support.

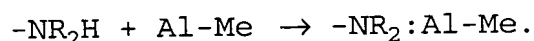
Step 3: Adding a nonfunctionalized metallocene of Formula III (see lines 25-38 on page 4 of the Hidalgo-Llinas document) to the organoaluminum-treated functionalized support from Step 2 (see lines 48-50 on page 8 of the Hidalgo-Llinas document).

In order to illustrate more clearly the composition of the final catalyst that is produced by the Hidalgo-Llinas process, we are enclosing herewith a document entitled "Scheme 1," which shows Steps 1, 2, and 3 and the possible chemical species that is formed. (Scheme 1 is a simplified summary showing some of the most probably generated chemical species on the solid and is rationally based on the best current scientific knowledge. However, the Applicants do not wish to be bound by any particular theory.)

MAO, which is an oligomer mixture of several chemically different species (linear and cyclic types of different molecular size), could probably react either with an  $\text{-NR}_2\text{H}$  group generating amido-type bonds, such as:



it may simply form a coordinative bond of the basic-acid type:



In Scheme 1, the metallocene shown is  $\text{Cp}_2\text{ZrCl}_2$ ; and it is believed that this metallocene reacts first with methyl groups from the MAO to be alkylated and the final cationic form is generated (i.e., the active species). (For the sake of simplicity, not all of the reactions are shown in Scheme 1. Only the presumably active catalytic species are shown.)

In summary, in the Hidalgo-Llinas document, the metallocene is bonded through a cation-anion interaction with an MAO molecule, which itself is bonded to the support through bonds with one of the ends (optional amino groups) of a "bifunctional" organic molecule, which in turn is bonded through the other end to surface silica. Silica reacts with this "bifunctional" organic reagent containing silica reacting groups (of the  $\text{Si}(-\text{OR})$  type) and optionally amino or thiol groups to render a functionalized silica prior to the contact with MAO.

The catalytic composition/system as claimed in currently amended Claims 1 and 21 differs from the catalytic system that is described in the Hidalgo-Llinas document because the claimed catalytic composition/system is made by a process that differs from the Hidalgo-Llinas process.

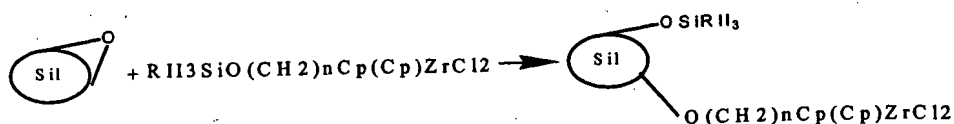
In currently amended Claims 1 and 21, a nonfunctionalized support is first reacted with an alumoxane (e.g., MAO), whereas in the Hidalgo-Llinas process the inorganic support is first functionalized by reaction with a bifunctional compound of Formula I (see lines 22-23 on page 8 of the Hidalgo-Llinas document) before the resulting functionalized support is reacted with an organoaluminum compound (e.g., MAO). Then, in currently amended Claims 1 and 21, after the nonfunctionalized support is reacted with an alumoxane (e.g., MAO), the resulting support is reacted

with a metallocene compound as defined by formula I, II, or III. By contrast, in the Hidalgo-Llinas process, after the functionalized support is reacted with an organoaluminum compound (e.g., MAO), the resulting support is reacted with a metallocene of Formula III (see lines 25-38 on page 4 of the Hidalgo-Llinas document); and none of the examples in the Hidalgo-Llinas document disclose or suggest using a metallocene compound with an  $\text{OSiR}^{\text{II}}_3$  functional group.

In order to illustrate more clearly the catalytic composition/system that is claimed by currently amended Claims 1 and 21, we are enclosing herewith a document entitled "Scheme 2," which shows Steps 1 and 2 and the possible catalytic compositions/systems that are formed. (Scheme 2 is a simplified summary showing some of the most probably generated catalytic compositions/systems and is rationally based on the best current scientific knowledge. However, the Applicants do not wish to be bound by any particular theory.)

In currently amended Claims 1 and 21, Si-O-Si siloxane groups are believed to remain after the inorganic support is reacted with the alumoxane (e.g., MAO), which reacts preferably and firstly with OH groups; and those remaining Si-O-Si siloxane groups are highly reactive with the  $\text{OSiR}^{\text{II}}_3$  functional group of the claimed metallocene compound.

The reactivity of the Si-O-Si siloxane groups has been reported by Dubois L.H. & Zegarsky B.R. (J. Am. Chem. Soc. 115, 1191-1193 (1993)) and by Blumel J. (J. Am. Chem. Soc. 117(7), 2112-2113 (1995)) and can be depicted as follows:



The reaction between the Si-O-Si siloxane groups and the  $\text{OSiR}^{\text{II}}_3$  functional group of the claimed metallocene compound allows for the apparent simultaneous interaction (with both silica and with MAO) of the metallocene with the inorganic support; and, this simultaneous interaction produces a different and stronger fixation of the metallocene compound to the support than is suggested by the Hidalgo-Llinas document and the other cited art. The simultaneous interaction, which is not taught or suggested by the Hidalgo-Llinas document and the other cited art, is advantageous because it produces catalytic compositions/systems that have higher activities and results in lower formation of polymer fine particles, which are features that are beneficial to the industrial production of polymers and copolymers.

In the outstanding Office Action, the Examiner rejects currently pending Claims 1-7, 10-18, 21, 23-25, and 27-37 for allegedly being obvious over European Patent Document No. 0 372 414 (hereinafter referred to as the "Antberg EPO document") and European Patent Document No. 0 206 794 (hereinafter referred to as the "Welborn document"). The Applicants respectfully traverse this rejection for the reasons that are set forth below; and, consequently, this rejection should be withdrawn.

(The Antberg EPO document is in German; and the undersigned attorney does not speak German. Therefore, rather than discussing the Antberg EPO document, the following discussion refers to Antberg et al.'s U.S. Patent No. 5,071,808 (hereinafter referred to as the "Antberg U.S. patent"), which is believed to be an English-language equivalent of the Antberg EPO document because the Antberg U.S. patent and the Antberg EPO document both claim priority to German Patent Application No. 3840772 (filed December

3, 1988).)

The catalytic composition/system that is claimed in currently amended Claims 1 and 21 has improved activity and, when used to (co)polymerizes olefins, produces improved polymer morphology (i.e., less fine polymer particle formation). The claimed catalytic composition/system achieves these results because the claimed metallocene compound with the  $\text{OSiR}^{\text{II}}_3$  functional group produces a superior, stronger, and different fixation to the support than what is taught or suggested by the cited art due to simultaneous interaction (bonding), which is described below:

- a. the known anion-cation interaction based on methylalumoxane (anion) and the claimed cationic metallocene compound; and
- b. additional bonding to the silica support through the reaction of the  $\text{OSiR}^{\text{II}}_3$  functional group of the claimed metallocene compound with remaining siloxane bonds after the silica has reacted with MAO.

Both the Antberg U.S. patent and the Welborn document fail to teach or suggest the catalytic composition/system that is claimed in currently amended Claims 1 and 21.

For example, the Antberg U.S. patent discloses a "heterogeneous metallocene component," which does not contain MAO and which is obtained by reacting a polymer:polymethylhydrogensiloxane (not silica) with a metallocene containing a side chain bonded to cyclopentadienyl ligands with a double bond. In order to be used in polymerization, MAO must be added to the reactor to activate the heterogeneous metallocene component. Because the Antberg U.S.



patent teaches that the metallocene must be attached to the support before it is exposed to the MAO, the Antberg U.S. patent does not teach or suggest the claimed catalytic composition/system, wherein a nonfunctionalized support is first reacted with MAO before the resulting support is reacted with the claimed metallocene compound with the  $\text{OSiR}^{\text{II}}_3$  functional group.

The Welborn document discloses a supported catalyst that is prepared by reacting a metallocene with an alumoxane in the presence of a support. However, the metallocenes that are disclosed or suggested by the Welborn document do not include the  $\text{OSiR}^{\text{II}}_3$  functional group as claimed in currently amended Claims 1 and 21; and, thus, additional bonding of the metallocene to the silica through ligands, which is expected in the claimed catalytic composition/system, is not possible in Welborn's supported catalyst.

A key aspect of the claimed catalytic composition/system is the simultaneous interaction (in the same solid composition) of the claimed metallocene compound with the alumoxane and with the silica (making use of the reactivity of the Si-O-Si siloxane bonds with ligands containing the claimed  $\text{OSiR}^{\text{II}}_3$  functional groups). This simultaneous interaction is not taught or suggested by the Welborn document or the Antberg U.S. patent.

In the outstanding Office Action, the Examiner rejects currently pending Claims 1-7, 10-18, 21, 23-25, and 27-37 for allegedly being anticipated by or obvious over Canich et al.'s WIPO International Publication No. WO 92/05203 (hereinafter referred to as the "Canich document"). The Applicants respectfully traverse this rejection for the reasons that are set forth below; and, consequently, this rejection should be withdrawn.

As mentioned above, in currently amended Claims 1 and 21, a nonfunctionalized support is first reacted with an alumoxane (e.g., MAO) and then the resulting support is reacted with the claimed metallocene compound, which is defined by formula I, II, or III and which has an  $\text{OSiR}^{\text{II}}_3$  functional group. There is a simultaneous interaction (in the same solid composition) of the claimed metallocene compound with the alumoxane and with the silica (making use of the reactivity of the Si-O-Si siloxane bonds with ligands containing the claimed  $\text{OSiR}^{\text{II}}_3$  functional groups). This simultaneous interaction is not taught or suggested by the the Canich document because the Canich document does not teach or suggest using the claimed metallocene compound with an  $\text{OSiR}^{\text{II}}_3$  functional group. Consequently, the claimed invention is novel and nonobvious over the Canich document.

As mentioned above, the claimed catalytic composition/system has improved productivity and results in improved polymer morphology (i.e., lower small polymer particle formation). These improvements are described in great detail in Appendix I, which is enclosed herewith. Because the improvements that are described in Appendix I are not taught or suggested by the prior art, currently amended Claims 1 and 21 are further nonobvious over the prior art.

The remaining claims (i.e., currently amended Claims 2-7, withdrawn Claim 8, currently amended Claim 10, previously presented Claim 11, currently amended Claim 12, previously presented Claim 13, currently amended Claim 14, previously presented Claims 15 and 16, currently amended Claim 17, previously presented Claim 18, withdrawn Claim 20, currently amended Claim 23, previously presented Claims 24, 25, 27-37, and withdrawn Claims 38 and 39) are nonobvious over the prior art because these remaining claims are each directly or indirectly dependent on a nonobvious base claim (currently amended Claim 1 or 21). In

addition, these remaining dependent claims are further nonobvious over the prior art because the prior art does not teach or suggest the particular features that are claimed in these dependent claims.

If currently amended Claims 1 and 21 are ultimately found to be allowable, then the Examiner is respectfully requested to consider nonelected Claims 8, 20, 38, and 39 on the merits because these nonelected claims are each dependent on an allowable elected base claim (currently amended Claim 1 or 21).

In view of the foregoing, favorable reconsideration of the amended application is respectfully requested. It is submitted that the claims of record are in condition for allowance. Allowance of the claims at an early date is solicited.

This Amendment amends currently pending Claims 1-7, 10, 12, 14, 17, 21, and 23. The amendments that are described in the preceding sentence were done to improve the language of the claims and were not done to overcome the prior art, to overcome rejections under 35 U.S.C. § 112, or to overcome any other rejections or objections. The amendments that are described in the first sentence of this paragraph shall not be considered necessary to overcome the prior art, shall not be considered necessary to overcome rejections under 35 U.S.C. § 112, and shall not be considered necessary to overcome any other rejections or objections.

The Applicants reserve the right to seek protection for any unclaimed subject matter either subsequently in the prosecution of the present case or in a divisional or continuation application.

The Commissioner is authorized to charge any additional fees which may be required or credit overpayment to Deposit Account No. 12-

0415. In particular, if this Amendment is not timely filed, then the Commissioner is authorized to treat this Amendment as including a petition to extend the time period pursuant to 37 C.F.R § 1.136(a) requesting an extension of time of the number of months necessary to make this Amendment timely filed; and the petition fee due in connection therewith may be charged to deposit account No. 12-0415.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first-class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on

September 21, 2004  
(Date of Deposit)

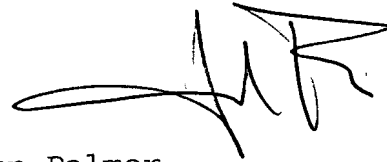
JOHN PALMER  
(Name of Applicant, Assignee  
or Registered Representative)

(Signature)

(Date)

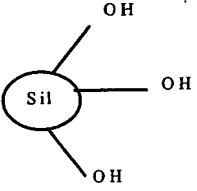
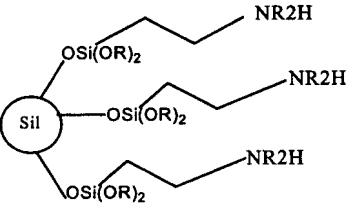
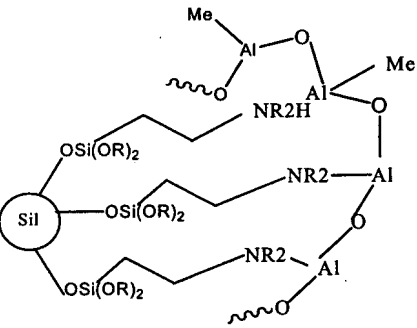
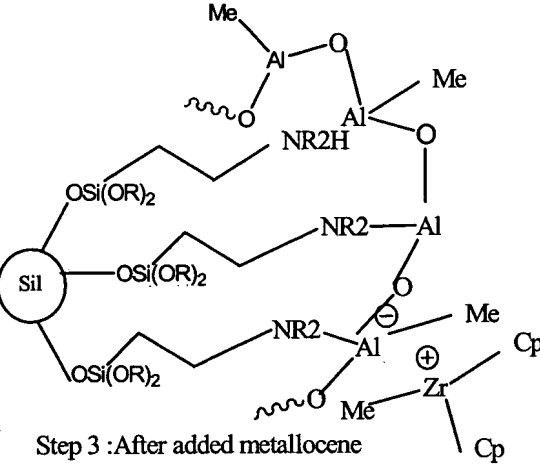
9-21-04

Respectfully submitted,

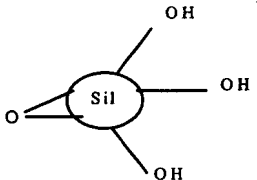
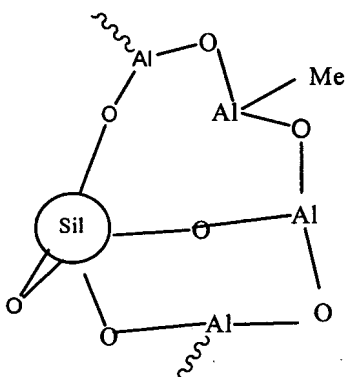
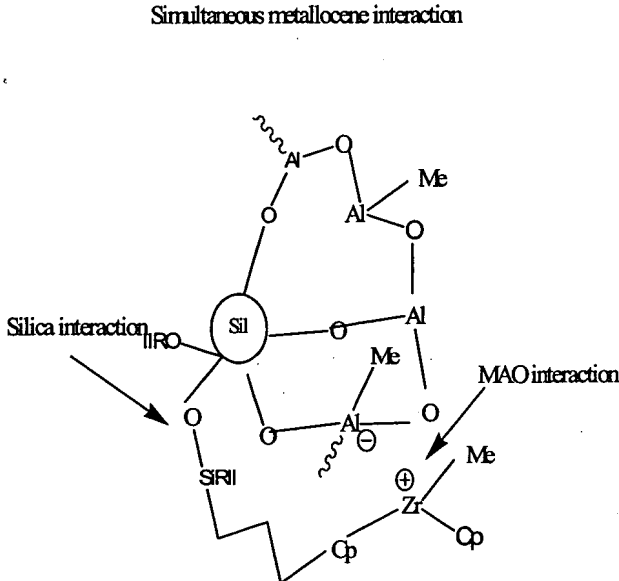


John Palmer  
Reg. No. 36,885  
LADAS & PARRY  
5670 Wilshire Boulevard  
Suite 2100  
Los Angeles, California 90036  
(323) 934-2300

**Scheme 1**  
**Catalytic composition disclosed by Hidalgo Llinas (EP 0 802 203)**

Solid precursor	Sequence of reactions of the support prior to contact it with the metallocene	Final form of catalyst
	 <p style="text-align: center;">Step 1 Functionalized silica</p>  <p style="text-align: center;">Step 2 :Funct.silica+ MAO</p>	 <p style="text-align: center;">Step 3 :After added metallocene</p>
<p>Silica containing hydroxy groups. Siloxane bonds not shown for clarity</p>	<p>Functionalized silica with optional NR<sub>2</sub>H groups is reacted in a second step with MAO .</p>	<p>Final catalytic composition: Initial metallocene (Cp)<sub>2</sub>ZrCl<sub>2</sub> is alkylated "<i>in situ</i>" (not shown) and the active species is bonded via an anion-cation interaction with MAO itself attached through a "bifunctional" organic molecule containing at one end silica reacting groups and at the other end optionally amino groups. [Cp = Cyclopentadienyl group]</p>

**Scheme 2**  
**Catalytic composition disclosed by instant patent application (US 09/299,539)**

Solid precursor	Sequence of reactions of the support prior to contact it with the metallocene	Final form of catalyst
	 <p>Step 1 :Silica reacted with MAO</p>	<p>Simultaneous metallocene interaction</p>  <p>Step 2 :Functionalized metallocene reacts with both silica surface siloxi bonds and MAO prereacted with silica .</p>
<p>Silica containing hydroxy groups and siloxane groups</p>	<p>Silica containing OH groups is made directly to react in one step with MAO. After reaction, it is expected that all OH groups react with MAO but most of the siloxane groups remain</p>	<p>Final catalytic composition:</p> <p>Initial metallocene <math>[\text{Cp}-(\text{CH}_2)_n-\text{OSiR}^{\text{II}}_3](\text{Cp})\text{ZrCl}_2</math> is alkylated "<i>in situ</i>" and the active species is bonded to the support via <b>two</b> main types of bonds (<b>simultaneous interaction</b>):</p> <ul style="list-style-type: none"> <li>a) an anion-cation interaction with MAO itself attached directly to silica; and</li> <li>b) a direct bond through the functional group attached to one of the Cp groups of the metallocene.</li> </ul> <p>Alternatively: A coordinative bond of the type <math>\text{R}^{\text{II}}_3\text{SiO}:\text{Al}</math> present in MAO could be formed instead for <i>some</i> metallocene molecules which eventually could not react with silica through the functional group as in the case above. In this case, also, an additional and simultaneous interaction occurs [which is not possible with non functionalized metallocenes (Welborn type metallocenes)]</p>

## APPENDIX I

In order to show the advantageous use of the catalyst composition made according to the method disclosed in the instant patent application, a carefully selected set of comparative experiments was designed and performed.

Comparative metallocenes **not containing** the  $R^H_3SiO$  group were synthesized, with the closest molecular structures to the ones disclosed in the present application. More specifically the following metallocenes were selected:

**A:**  $(C_5H_4-(CH_2)_3-OSiMe_3)(C_5H_5)ZrCl_2$  [i.e., a typical metallocene of the instant patent application]

**B:**  $(C_5H_4-(CH_2)_3-SiMe_3)(C_5H_5)ZrCl_2$  [i.e., closest molecular structure to metallocene A without the oxygen atom and not able to produce "simultaneous interaction" with silica modified with MAO].

**C:**  $(C_5H_4-(CH_2)_3-CH_3)(C_5H_5)ZrCl_2$  [i.e., close molecular structure to metallocene A and typical and representative example of the metallocenes used by Welborn (similar to catalyst D in Welborn examples except in that in said catalyst both cyclopentadienyl ring are substituted with butyl groups instead of one ring only)].

### Comparative activity:

Firstly, the activity of the 3 above identified metallocenes (A, B and C) was measured in ethylene copolymerization under *homogeneous conditions*, i.e., in the absence of support, using MAO in solution.

## APPENDIX I

Copolymerization was performed under the same exact conditions for the 3 metallocenes as described in Comparative Example 20 of the present application except that 85°C was maintained instead of 70°C, 10 ml of 1-hexene was added instead of 20 ml, 5,3 ml of a solution of MAO 10% in toluene instead of 2,7 ml, 30 minutes polymerization instead of 15 minutes and the prescribed amount of metallocene as shown in Table 1. The results obtained are shown in Table 1.

Table 1

**Comparative activity of metallocenes A, B and C under homogeneous conditions**

<b>Metallocene</b>	<b>Mmols used</b>	<b>Activity (gPE/mol Metxhxatm)</b>	<b>Relative activity</b>
<b>A</b>	$5.7 \times 10^{-4}$	$1.25 \times 10^7$	<b>1</b>
<b>B</b>	$5.9 \times 10^{-4}$	$1.18 \times 10^7$	<b>0.944</b>
<b>C</b>	$6.9 \times 10^{-4}$	$1.03 \times 10^7$	<b>0.824</b>

These results show that the activity of metallocene A (instant patent application) under homogeneous conditions has similar activity than typical metallocenes also very closed in molecular structure but without the group  $\text{OSiR}^{\text{II}}_3$  (used for example by Welborn).

One of the objectives of the present invention is to provide **supported catalysts** whose activity is comparatively higher under heterogeneous condition than that obtained with other metallocenes known in the previous state of the art even if the metallocenes (present invention) used as a component to prepare the said supported catalysts show, under homogeneous conditions, similar activity.

The solution provided by the instant invention is based on the heterogeneous catalytic composition obtained by reacting a porous inorganic support with an aluminoxane and specific metallocenes containing a  $\text{OSiR}^{\text{II}}_3$  group such as metallocene A, for example. In order to show one of the objectives of the present invention (comparative activity of supported catalysts), 3 supported catalysts were prepared according to the method disclosed in Example 11 with the exception that the silica modified with MAO contained 14% by weight Al instead of 23% and 0,079 mmol of respective metallocene A, B or C was used instead of 0,2 mmol thus making supported catalyst with the same %Zr content (0.24 % weight).

**Supported Catalyst A:** Made as above by using metallocene A.

**Supported Catalyst B:** Made as above by using metallocene B.

**Supported Catalyst C:** Made as above by using metallocene C.

Low pressure polymerization:



## **APPENDIX I**

Copolymerization of ethylene and 1-hexene was performed (under the same conditions for all the 3 catalysts) as in Example 27 with the exception that 85°C was maintained instead of 70°C, 10 ml hexene was added instead of 20 ml and 30 minutes polymerization time instead of 15 minutes.

After copolymerization, the weight of polymer recovered was weighed and the productivity for the 3 catalysts calculated. The results obtained are shown in Table 2.

**Table 2**  
Comparative copolymerization activity of supported metallocenes at 4 bar

<b>Supported catalyst</b>	<b>Productivity (g copolymer/g supported catalyst.hour)</b>	<b>Relative productivity</b>
Supported A	398	1
Supported B	158	0.397
Supported C	174	0.437

Results of Table 2 clearly show the superior performance in activity of supported catalyst A even if the metallocene used to obtain the supported catalyst showed, under homogeneous condition (non supported, Table 1), similar activity.

In this case, comparative activity is calculated in terms of productivity per gram of supported catalyst (more useful parameter in terms of industrial practice). The content of Zr for the 3 catalysts was the same.

### **High pressure copolymerization**

Copolymerization of ethylene and 1-hexene was also performed (under the same conditions for all the 3 catalysts) as in Example 30 with the exception that 142 ml hexene was added instead of 49,6 ml and 30 mg of each supported catalyst was used.

After copolymerization, the weight of polymer recovered was weighed and the productivity for the 3 catalysts calculated. The results obtained are shown in Table 3.

**Table 3**  
Comparative copolymerization activity of supported metallocenes at 40 bar

## APPENDIX I

Supported catalyst	Productivity (g copolymer /g supported catalyst.hour)	Relative Productivity	Copolymer
A (instant patent application)	3933	1	Pol-A
B	2367	0.601	Pol-B
C	2167	0.550	Pol-C

In all cases, the productivity of the supported catalyst A (present patent application) is higher again than the productivity observed with catalysts B and C obtained following the teachings of Welborn.

It is concluded that supported catalysts obtained according to the present invention are different to the ones obtained by Welborn as explained before and its use is comparatively advantageous showing under the same conditions higher productivity.

### Polymer morphology

Formation of "fines" (small size polymer particles) creates problems in industrial operations mainly concerned with solid liquid or solid gas separations among others. So, a catalyst with reduced formation of fines would solve industrial problems and would be of high interest. Thus, other of the objectives of the present invention is to provide a supported catalyst producing polymers with reduced amount of polymer fines, lower than that known in the previous state of the art.

It is usually found that percentage of polymer fines observed under industrial operation conditions is higher than in laboratory scale but tests under later conditions are performed to *select the best* candidates even though under these conditions the comparative differences among different catalysts are smaller than in the former case.

Analysis of the polymer size particle distribution was performed for the 3 polymers products obtained: (Pol-A, Pol-B, Pol-C) obtained at 40 bar copolymerization. The relevant results obtained are shown in Table 4.

**Table 4**  
**Polymer size distribution**

Catalyst	% size < 163 microns	% size < 222microns	% size < 300 microns
Pol-A	0.00	0.11	0.71
Pol-B	0.32	0.88	3.70
Pol-C	0.14	1.17	6.06

## APPENDIX I

These data, again, show the differential behaviour of supported catalyst A (instant patent application) in comparison with prior art catalysts. The amount of small size polymer particles using the catalyst of the present invention is lower than that obtained with prior art catalysts (Welborn).

These results are not obvious or suggested by any of the mentioned documents by the Examiner (Antberg or Welborn) and experts in the state of the art would choose preferable catalyst A if were to be used under industrial practical operation.